

neral Wilson. Communicated by S. H. Christie, Esq., M.A., Sec. R.S.

The author states that the Régar of India is found, by chemical analysis, to consist of silica, in a minute state of division, together with lime, alumina, oxide of iron, and minute portions of vegetable and animal *débris*. Hence it is usually considered as having been formed by the disintegration of trap rocks: the author, however, after examining its numerous trap dykes traversing the formation of the ceded districts, which he found invariably to decompose into a ferruginous red soil, perfectly distinct from the stratum of black régär through which the trap protrudes, was led to regard this opinion of its origin as erroneous: and from the circumstance of its forming an extensive stratum of soil covering a large portion of the peninsula of India, he believes it to be a sedimentary deposit from waters in a state of repose.

Specimens of basaltic trap and of the Régär soil were transmitted to the Society by the author, for the purpose of analysis.

The reading of a paper, entitled, "Experimental Researches in Electricity," Thirteenth Series, by Michael Faraday, Esq., D.C.L., F.R.S., &c., was resumed but not concluded.

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March 29, 1838.

JOHN GEORGE CHILDREN, Esq., V.P., in the Chair.

Simon MacGillivray, Esq., was elected a Fellow of the Society.

The reading of a paper, entitled, "Experimental Researches in Electricity," Thirteenth Series, by Michael Faraday, Esq., D.C.L., F.R.S., was resumed but not concluded.

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April 5, 1838.

FRANCIS BAILY, Esq., V.P. and Treas., in the Chair.

John Hardwick, John Macneill, and Edward William Tuson, Esqs., were elected Fellows of the Society.

The reading of a paper, entitled, "Experimental Researches in Electricity," Thirteenth Series, by Michael Faraday, Esq., D.C.L., F.R.S., was resumed and concluded.

The author, in this paper, pursues the inquiry into the general differences observable in the luminous phenomena of the electric discharge, according as they proceed from bodies in the positive or the negative states, with a view to discover the cause of those differences. For the convenience of description he employs the term *inductric*, to designate those bodies from which the induction originates, and *inducteous* to denote those whose electric state is disturbed by this inductive action. He finds that an electric spark, passing from a small ball, rendered positively *inducteous*, to another ball of larger diameter, is considerably longer than when the same

ball is rendered positively *inductric*; and that a similar difference, though to a less extent, is observable, when the smaller ball is rendered negative. The smaller ball, rendered positive, gives also a much longer spark than when it is rendered negative; in which latter case, however, it affords, at equal distances, a luminous brush of greater size, and gives it much more readily than when positive. In order to ascertain the relative degrees of charge which the balls acquire before the occurrence of the discharge, the author employed an apparatus attached to the insulated conductor of the electrical machine, and also to the conductor connected with the discharging train, and consequently uninsulated, consisting, on each side, of a rod branching out in the form of a fork, and terminating, at one of its extremities in a large ball, and at the other in a small one; the position of the forks being capable of adjustment, so that the large ball of each rod might be brought exactly opposite to the small one of the other: and the distances between each pair admitted of being regulated at pleasure, until the discharges through each interval were rendered apparently equal to one another. From numerous experiments made with this instrument, the author concludes that when two conducting surfaces of small but equal size, are placed in air, and electrified, the one positively and the other negatively, a discharge takes place at a lower tension from the latter than from the former; but that, when a discharge does occur, a greater quantity of electricity passes at each discharge from the positive, than from the negative surface. Experiments of a similar nature were made in gases of different kinds, by enclosing them in an apparatus constructed on the same plan as the former one, but capable of acting in a receiver, from which the air could be exhausted, and the particular gas, whose powers in modifying the electric discharges were to be ascertained, could be introduced in its place. The results of various trials are given in a table, from which it appears that different gases restrain the discharge in very different degrees. The discharge from the small ball, through nitrogen and hydrogen gases, most readily takes place when the charge is positive; and through oxygen, carbonic acid, and coal gas, when it is negative.

The author next directs his attention to the peculiar luminous phenomena attending the disruptive electrical discharge, which he terms a *glow*, and which appears to depend on a quick, and almost instantaneous charge given to the air in the immediate vicinity, and in contact with the charged conductor; and he enters into a detailed account of the circumstances by which it is influenced, and its production favoured; such as diminution of the charging surface, increase in the power of the machine, rarefaction of the surrounding air, and the particular species of electricity concerned. The relations which the glow, the brush, and the spark bear to one another, as well as the steps of transition between each are minutely investigated; and the conclusion is deduced that the glow is in its nature exactly the same as the luminous part of a brush or ramification, namely, a charge of air; the only difference being that the glow has a continuous appearance from the constant renewal of the same action in the same place, whereas the ramification is occa-

sioned by a momentary and independent action of the same kind. The disruptive discharge may take place at degrees of tension so low as not to give rise to any luminous appearance; so that a dark space may intervene in the line of actual discharge, as is frequently observable between the brush on one side, and the glow on the other. Thus it is inferred that electric light is merely a consequence of the quantity of electricity which, after a discharge has commenced, flows and converges towards the spot where it finds the readiest passage: and these conclusions are further confirmed by the phenomena which take place in other gases, besides atmospheric air, and which are specifically detailed by the author.

The last kind of discharge which is here considered is the *convective* or *carrying discharge*, namely, that effected by the translation of charged particles from one place to another. The phenomena attending this mode of transference are examined under various aspects as they occur in air, in liquids of various kinds, in flame, and as they are exhibited in the case of particles of dust, which perform the office of carriers of the electricity; and also in that of solids terminated by liquids. Thus all these apparently isolated phenomena comprised under the heads of the electric currents which characterize electrolyzation, of transference through dielectrics by disruptive discharges of various kinds, or by the actual motion of charged particles, and of conduction through conductors of various degrees of power, are assimilated to one another by their being shown to be essentially the result of actions of contiguous particles of matter assuming particular states of polarization.

The author lastly considers electric currents, not only in their effects on the bodies they traverse, but also in their collateral influences as producing inductive and magnetic phenomena. The analogies, which connect electrolytic discharge with that by conduction, are pointed out, as tending to show that they are essentially the same in kind, and that when producing different kinds of motion in the particles of matter, their mode of operation may be regarded as identical. An attempt is made to connect with these views the lateral or transverse actions of currents, which are most distinctly manifested in their magnetic effects; these effects being produced equally by the disruptive, the conductive, and the electrolytic discharges, and probably depending on the transverse condition of the lines of ordinary induction. This transverse power has the character of polarity impressed upon it, and, in its simplest form, appears as attractive or repulsive, according as the currents themselves are in the same, or in opposite directions. In the current and in the magnet it assumes the condition of tangential force; and in magnets and their particles it produces poles.

The author announces that he intends shortly to develop, in another series of these researches, some further views which he entertains concerning the nature of electric forces and electric excitation in connexion with the theory he has here advanced.

The Society then adjourned over the Easter Recess to meet again on the 26th instant.